



Thwake

Issue 5

Period up to June 2024

Dam Journal

A publication of the Ministry of Water, Sanitation and Irrigation and the Program Implementation Team (PIT)

BEACON of Sustainable Development

Completion of Dam Embankment ahead of schedule paves way for critical downstream components such as water supply and sanitation, hydropower development and irrigation

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Kenya
VISION 2030



Dams hold immense power to stimulate food production as they cut over-reliance on rain-fed agriculture. If we produce more food, it means more earnings for our farmers and more jobs for our youth.

*~ His Excellency Dr. William Samoei Ruto, C.G.H.,
President of the Republic of Kenya and
Commander-in-Chief of the Defence Forces*



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Thwake Dam Journal reports on activities, developments and milestones at the Thwake Multipurpose Water Development Program (TMWDP) - a key Vision 2030 flagship program being implemented in the Lower Eastern counties of Makueni, Kitui and parts of Machakos.

Thwake Dam Journal is published quarterly by the Ministry of Water, Sanitation and Irrigation and the Program Implementation Team (PIT). Views expressed in this publication do not necessarily reflect the position of Thwake Multipurpose Water Development Program (TMWDP).

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Thwake Multipurpose Water Development Program



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Note from the Editor



*Thwake Dam
poised to be
an instrument
of peace and
development.*

The water sector in the country and the world at large is reaching a tipping point where nations are struggling to find spaces for proper and sustainable discourses on water communication with stakeholders. According to researchers and opinion shapers in the sector, growing water demand and water scarcity caused by issues of climate change, population growth, urbanization, water pollution, and poor management of water resources have aggravated the crisis – calling for sustained communication infrastructure to inform stakeholders on progress.

Effective communication on water issues - especially dam construction - will significantly change the water equation in the country as the government lays out plans to construct dams. Thwake Dam Journal comes as an ideal and critical communication tool for dam construction in the country and region at large. This publication provides a forum for exchange of information on many topical issues and ongoing developments and progress of Thwake Multipurpose Water Development Program – a critical pillar in catapulting Bottom-Up Economic Transformation Agenda (BETA), Vision 2030 and an enabler of socio-economic growth for millions of residents in the Lower Eastern region of the country.

Progressively, and through the support of all stakeholders, the editorial team would like to thank everyone for the massive support which has seen this publication maintain its rightful place as the leading platform for Dam Communication.

As you will notice, this current issue has thought-provoking articles ranging from H.E President Dr. William Ruto's take on this facility, mentorship programs by staff, how the Dam is poised to be an instrument of peace and development, discourses from the African Development Bank (AfDB) Supervision Mission, human-wildlife co-existence within the dam's precincts, a visit by the Parliamentary committee on Blue Economy, an insight from various experts on engineering issues, and many more.

Cheers,
Godfrey

Message from the Cabinet Secretary

Zachariah M. Njeru, EGH



Embankment completion milestone gives hope for residents

Recently, I witnessed the celebration marking the last filling of materials at the embankment area of Thwake Multipurpose Dam. This exercise marks a great milestone for the dam as it now paves way for the settlement and implementation of the bridge over the embankment, concrete face, installation of the gates and other downstream activities including water supply, hydropower development and irrigation.

I am glad to announce to you that the Ministry has already requested the National Treasury to open negotiations with the African Development Bank (AfDB) which had indicated interest in funding the downstream components from their energy, agriculture and water portfolio.

These downstream components will have a big impact on food

security because the three counties of Makueni, Kitui and parts of Machakos, have fertile soils suitable for farming activities. Wananchi are therefore waiting to see the fruits and benefits from this Dam.

But even as we expect to complete the first phase of this project by 6th December 2024 and embark on the next phases, we must not tire. Let us all embrace team work and ensure we achieve the objectives of this project.

I urge the contractor, the supervising consultant and the implementation teams to ensure all pending issues are addressed.

Achievement of accomplishments such as this, obviously cannot be realized without concerted team efforts working together and combining synergies geared towards achieving the objective and purpose. Without team collaborations and

cooperation, this milestone would have not been accomplished easily. I thank you all.

The entire fraternity at the Ministry of Water, Sanitation and Irrigation is proud of everyone who supported the achievement of this great milestone.

The government will be supportive and act as a facilitator in ensuring this project achieves its final mandate and objectives. I also express heartfelt gratitude to all staff, the contractor, the supervising consultant and all stakeholders for their continuous support and contribution.

Even as we head towards critical phases, I urge for concerted effort and participation from all stakeholders.

Let us all focus our eyes on the ball, set realizable timelines and finally achieve the objectives and the vision of this life-changing project.

Message from the Principal Secretary

Julius K. Korir, CBS



Thwake Multipurpose Dam a key pillar in State's transformation agenda, BETA

Thwake Multipurpose Water Development (TMWDP) is considered one of the key projects that will propel the achievement of the Bottom-up Economic Transformation Agenda (BETA) by the Government of Kenya.

Kenya, is one of the countries in the sub-Saharan Africa quickly developing and transforming into a middle-income economy and water will play a critical role in socio-economic development. Even as the country is proactively utilizing all channels on the global, continental, and regional level to enhance its role as a leader in the region, the Ministry is keen to ensure that construction of dams will be one of the major undertakings to propel the development.

Thwake Multipurpose Water Development Program is poised to join some of the world's leading dams which will hugely tilt the socio-

economic and development matrix of implementing countries. As I had earlier indicated, the Ministry of Water, Sanitation and Irrigation has prepared an investment plan to enable the country to have 100 per cent coverage of water and sanitation in the year 2030, in line with Vision 2030.

Indeed, water is a right and it is enshrined in our constitution. All citizens have a right to clean water and also dignified sanitation. Statistics indicate that only 33 per cent of the country's citizens have access to safely managed sanitation, while 27 per cent of Kenya's population lack access to safe drinking water.

We must therefore agree that provision of safe drinking water and adequate sanitation must be given priority for the country to hit its development and growth milestones. It is for this reason that I urge all stakeholders involved in the

construction of Thwake Multipurpose Dam, to up their game and ensure the objective of this game-changing project is met.

As we head towards the completion of the first phase and begin the critical downstream phases, we must all remember the significant contribution which Thwake Multipurpose Dam will have on the lives of the residents.

This project will fulfill the country's long-term development ambition in the areas of water, energy and agriculture and will provide regulation of flows on River Athi downstream of the dam for flood control and drought mitigation.

Indeed, once we complete the construction of this dam, we will enter into the histories of industrial revolution. We will create jobs and wealth, and change the narrative often associated with poverty.

Message from the Water Secretary

Eng. Samuel A. O. Alima, EBS



Completion of Phase One now beckoning

In the period under review, construction of the Dam's civil works and other related activities took a significant trajectory which saw achievements of key milestones.

Notably, there was significant progress in key salient features such as the embankment, whose filling has since been completed successfully. There was also progress on the spillway, the spillway weir and piers, grouting works and the construction of employer's camp.

Despite all this progress and achievements, there were also some challenges which impacted the projected completion date of this project. A case in point is that on 22nd December 2023 the Contractor applied for extension of time to December 2024 in order to complete the project. The Contractor cited several reasons for the delay, including treatment of the Dam foundation for

geological defects, design changes that led to cancellation of the emergency spillway, adverse geological conditions that rendered one of the quarries unusable, insufficient cash flows and the impact of El-Nino rains which pounded the country earlier in the year.

But the good news is that, the process of initiating the roll-out of key downstream components activities have already been finalized with designs and tender documentations completed, reviewed and accepted by the Ministry of Water, Sanitation and Irrigation.

As communicated earlier, the Ministry has since requested the National Treasury to open negotiations with the African Development Bank (AfDB) which had indicated interest in funding the downstream components.

On pollution control, there is already a multi-sectoral committee drawn from a number of players and institutions in place to spearhead catchment protection and pollution control activities on Athi River.

Progress has been noted in construction of ablution blocks in the informal settlement areas, enforcement of non-compliance by the industrial sites, construction of waste water trunk lines and cleaning of polluted rivers.

Solid waste was identified as another serious concern in pollution control and the team tasked the Nairobi City County to develop and present a solid waste management plan for implementation to control pollution problems in Nairobi Basin Rivers which feed into the Thwake Dam.

Eng. SAO Alima is also the Project Engineer



Milestone as Thwake Dam Embankment is completed ahead of schedule

By Godfrey Olali

The first phase of Thwake Multipurpose Dam recently hit a significant milestone with the completion of the critical Embankment area ahead of schedule, paving way for other critical downstream phases.

This development, according to the dam builders and other experts at the Ministry of Water, Sanitation and Irrigation, heralds a new paradigm for socio-economic upliftment for the millions of residents in the Lower Eastern region.

“This is big milestone for this project and I want to thank all the teams that have been involved in

the construction, it is a story of success because all of us played a critical role,” said Water, Sanitation, and Irrigation Cabinet Secretary Zachariah Njeru moments after he announced and witnessed placement of the last materials for embankment filling.

According to the Ministry, downstream components activities have already been finalized with designs and tender documentations completed, reviewed and accepted.

The Ministry has further requested the National Treasury to open negotiation with the African Development Bank (AfDB) which

had indicated interest in funding the downstream components from their energy, agriculture and water portfolios.

The Contractor’s scope of work entails construction and installation of a concrete faced rock fill dam, main and emergency spillway, low level outlet, intake tower, access roads, hydro mechanical plant, electrical and mechanical plant, access road over the dam connecting Kitui and Makueni counties and employer’s camp.

As part of the overall objective by the Government of Kenya to fulfill the country’s long-term development



Former Water, Sanitation and Irrigation Cabinet Secretary Zachariah Njeru (in khaki trousers), the Principal Secretary, State Department for Water and Sanitation Julius Korir (in blue trousers) and a host of other leaders including the Water Secretary Eng. Samuel A.O Alima tour the ongoing works during the completion of the embankment filling exercise

Pictures/ Courtesy/PIT

plan in the areas of water, energy and agriculture, under the government Bottom Up Economic Transformation Agenda (BETA), the ministry is keen to ensure seamless implementation of these downstream components.

“To herald a new paradigm and socio-economic upliftment for the millions of residents in the Lower Eastern Region, the Ministry has already finalized the designs and tender documents for the critical downstream components,” further revealed the CS during the witnessing celebration.

The CS was accompanied by Principal Secretary, State Department for Water and Sanitation Julius Korir, Water Secretary Eng. Samuel Alima, Makueni County Commissioner Henry Wafula, Chairperson, Tana Water Works Development Agency Hon. Regina Ndambuki, Chief

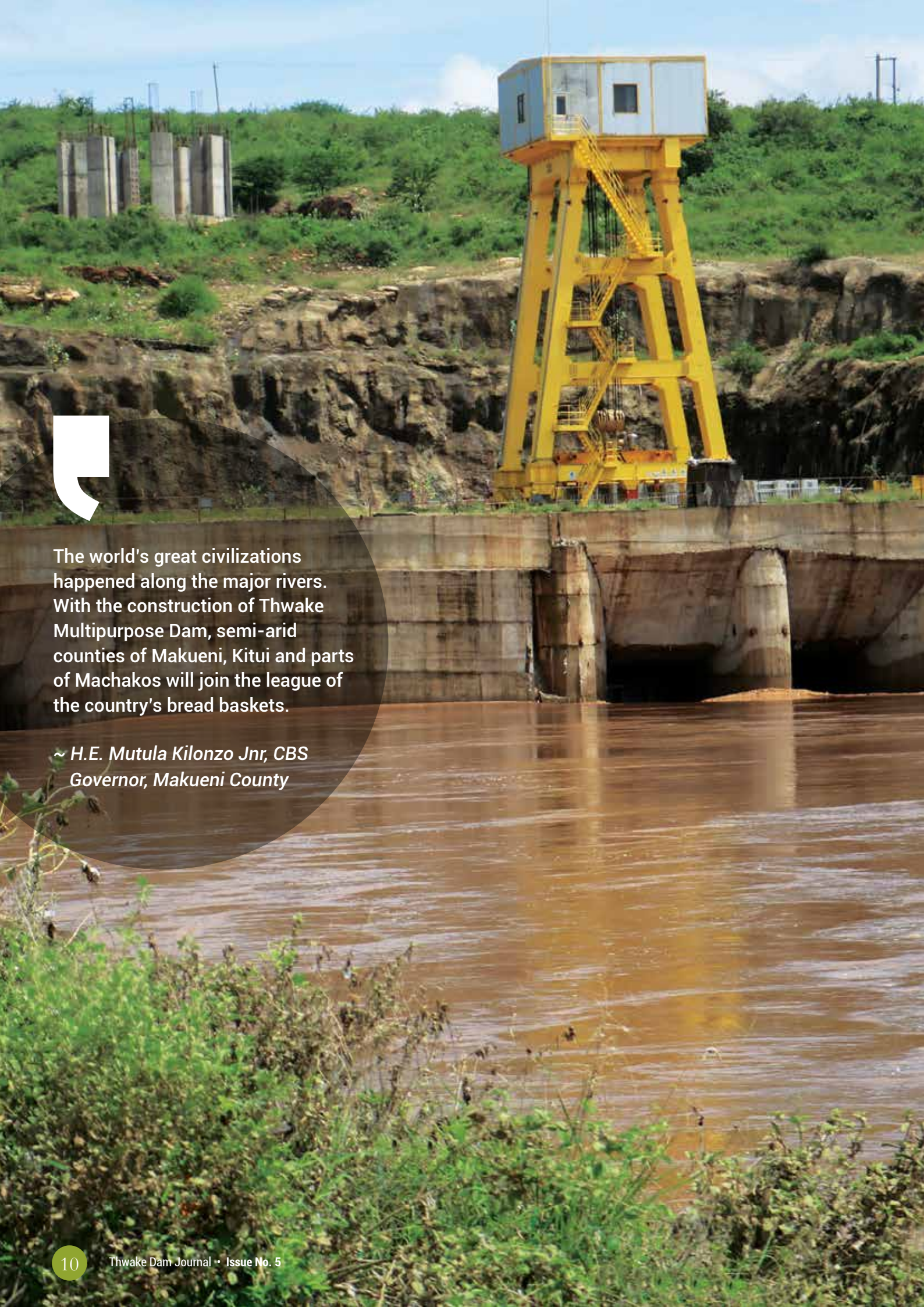
Executive Officer, Tanathi Water Works Development Agency Eng. Tito Mwamati, a team from the Contractor, Consultant and the Ministry.

The benefits of the downstream component’s activities include water supply with an estimated water production capacity of 150,000m³/d and projected to benefit a population of approximate 1.3 million people, sanitation which is also projected to benefit over 10,000 people in Wote and Kibwezi Towns, hydropower and transmission component projected to produce 20MW of energy and irrigation component comprising of development of an irrigation scheme to ultimately irrigate 40,000 hectares (approx. 100,000 acres) of land.

Government has also identified environmental concerns and river pollution in the catchments of the Dam. Both Thwake and Athi Rivers

traverse urban areas that are not adequately sewered. The pollution load to be carried to the Dam has been identified as a serious risk to the proper functioning of the Dam. The Government is working through the Nairobi River Commission, China Energy and the Inter-Agency Technical Committee in the Ministry to streamline the activities of various Government departments to act in cleaning Nairobi River and manage siltation in Thwake River.

The multi-sectoral Inter-Agency Technical Committee include Water Resources Authority, National Environment Management Authority (NEMA), Ministry of Water, Counties of Nairobi, Kiambu, Kajiado, Machakos and Makueni, Athi River Water Works Development Agency, Nairobi River Commission, Ministry of Environment, National Irrigation Authority among others.



The world's great civilizations happened along the major rivers. With the construction of Thwake Multipurpose Dam, semi-arid counties of Makueni, Kitui and parts of Machakos will join the league of the country's bread baskets.

~ H.E. Mutula Kilonzo Jnr, CBS Governor, Makueni County



President Ruto:

“Thwake Multipurpose Dam is a bankable project and a catalyst for sustainable development”

By Godfrey Olali and PCS

President William Ruto has indicated his optimism and confidence that Thwake Multipurpose Water Development Program (TMWDP) is a bankable project poised to uplift many lives in the lower region of the country.

While speaking in Wote town, Makueni County early this year, the Head of State said that after completion, the dam will provide water for domestic use, livestock and irrigation for the purpose of increasing food production in the region.

“We are going to increase the size of the dam. The dam is expected to be complete by mid this year. I will come to commission it before the end of the year,” said Dr. Ruto.

He said the money has been made available for the expansion of the dam to meet the needs of residents in the region. Dr. Ruto has been on record stating that

the Government has prioritised the construction and expansion of dams to rebuild agriculture.

“If we produce more food, it means more earnings for our farmers and more jobs for our youth. Irrigation is the most transformational intervention we can undertake in agriculture,” the head of state has said in the past.

He noted that dams hold immense power to stimulate food production as it cuts over-reliance on rain-fed agriculture. The Government plans to build 100 large and 1,000 small dams, thereby increasing the acreage under irrigation from the current 670,000 to 3 million.

The Government is keen to initiate Public Private Partnerships to deliver 100 dams and in a bid to progressively increase land under irrigation to three million acres. The head of state has also stated that in three years, the government plans to expand the land under



Irrigation is the ultimate solution in guaranteeing food security in our country. We are working on innovative investment mechanisms through private-public partnerships to construct at least 100 dams.

irrigation to 1.4 million acres citing irrigation as the surest intervention to countering food shortage.

“Irrigation is the ultimate solution in guaranteeing food security in our country. We are working on innovative investment mechanisms through private - public partnerships to construct at least 100 dams,” he stated.

The Government of Kenya and the African Development Bank (ADB) through the Ministry of Water, Sanitation and Irrigation is implementing Thwake Multipurpose Water Development Program Phase 1.

This is a flagship program under Vision 2030 of the Government of Kenya (GOK) whose overall objective is to fulfill the long-term country’s development ambition in the areas of water, energy and agriculture, and a key project under the Government Bottom Up Economic Transformation Agenda (BETA).

It will also provide regulation of flows on River Athi downstream of the dam for flood control and drought mitigation.

The program under which the project is being implemented has four phases namely, construction of an 80.5 m high multi-purpose dam with storage capacity of 688 million cubic meters and associated preliminary works

located one kilometer downstream of the confluence of Thwake and Athi Rivers.

A concrete-faced embankment dam covering an area of 9,217 acres, with a catchment spanning about 10,276 km², development of water supply, sanitation and waste water infrastructure to supply estimated 150,000 m³/day of treated water to approximately 1.3 million people drawn from the rural areas of Kitui and Makueni Counties and Konza Techno City in Machakos County and the development of hydropower generating system with an installed capacity of approximately 20 MW.

The fourth phase will see development of an irrigation scheme to ultimately irrigate 40,000 hectares (approx. 100,000 acres) of land.

The Ministry is currently implementing phase 1 of the Program. The construction company was contracted in November 2017 with a scope of constructing an 80.5 meter Concrete Face Rockfill Dam (CFRD) at the confluence of Athi and Thwake rivers in Makueni and Kitui counties with a storage capacity of 688 million m³.

The contract sum was Ksh 36,971,346,445. The procurement process was guided by the Africa Development Bank’s procurement rules and guidelines for works and services.





Thwake Multipurpose Dam will not only be critical in flood control for the downstream areas, but will also act as an anchor for sustainable food security in the Lower Eastern region. Crops and livestock need water to survive, while agricultural infrastructure requires large quantities of water for irrigation and various production processes.

~ *Julius K. Korir, Principal Secretary,
State Department for Water
and Sanitation*



MPs vow to push for faster completion of Thwake Dam

By Peter Musuva

The project is expected to provide water supply, hydro power generation of up to 20MW and irrigation downstream.

Members of Parliament drawn from the Parliamentary Committee on Blue Economy, Water and Irrigation have promised to take the lead and ensure concerns over slow progress and timely completion of Thwake Multipurpose Dam are fully addressed.

Speaking recently during a site appraisal inspection of the Vision 2030 enabler project expected to benefit at least 1.3 million residents drawn from the rural parts of the Lower Eastern counties, the MPs indicated the need for the Ministry to ensure all technical challenges affecting the completion are properly looked into.

The dam is being constructed at the confluence of River Athi and Thwake

in the borders of Makueni and Kitui counties.

“This project is expected to provide water supply, hydro power generation of up to 20MW and irrigation downstream. The residents from Makueni and Kitui have waited for long. This is why as a committee we are committed to see these issues addressed,” said the committee Chairman Hon. David Kangongo.

Other members in the delegation included Hon. Maisori Marwa (Vice Chairman), Hon. Eng. Stanley Muthama, Hon. Amina Mnyazi and Hon. Eng. Paul Nzengu. Makueni MP Hon. Susan Kiama, local leaders, the county administration, the contractor, supervising consultant and project staff were also present.

The construction period of the dam to completion was expected to end on 4th November 2022. However, the date was not attained and the contractor applied for extension of time based on delays in works progress because of an increase in dam height, issues related to underground excavations especially at the river bed section which had unexpectedly weak foundation, and the COVID 19 pandemic resulting to scaling down of labour force.

The contractor also had financial challenges and that contributed to their inability to mobilise additional funds and machinery to the site to ensure the extended timeline was attained.

The MPs further added that the Government is interested in funding the downstream phases of the dam noting that the project, currently on its first phase, will be a game-changer urging all the parties concerned to work with synergy ensuring the target completion date for phase 1 is achieved.

“We have further agreed with the contractor to sort out the legal issues with the subcontractor,” the MPs added.

The Government of Kenya and the African Development Bank (AfDB) through the Ministry of Water, Sanitation and Irrigation are implementing Thwake Multipurpose Water Development Program.

The program, which is designated as a Vision 2030 project of the Government of Kenya (GOK) and a key development investment, comprises a multi-purpose dam for water supply, hydropower generation and irrigation development and is being implemented in four phases.

Peter is the Senior Monitoring and Evaluation Expert for the Program

State to commission first phase of Thwake Multipurpose Dam in December, Water PS Korir promises during inspection tour

By Zachariah Mungai

The Principal Secretary, State Department for Water and Sanitation Julius Korir, has revealed that official commissioning of the first phase of Thwake Multipurpose Dam will be conducted in December this year.

Speaking recently during a site inspection and appraisal tour on implementation of the dam's civil works and other related activities, the PS noted that he was happy with the progress adding that H.E. President William Ruto is expected to commission the multi-billion water reservoir by end of this year.

"As a Ministry, we gave a commitment to the head of state that the embankment section of the Dam will be completed by May. So far I am extremely happy that we are even ahead of schedule because the section will be completed in the next few days," he noted of the facility, which has so far recorded a progress rate of 92 per cent.

It was also noted that the Dam's critical paths have progressed well with the embankment expected to be completed in the next 20 days before the contractor allows it to settle and start working on the bridge and the electromechanical area.

The PS further assured the contractor of his commitment in ensuring



The Principal Secretary, State Department for Water and Sanitation Julius Korir, while accompanied by the Water Secretary Eng. Samuel A.O Alima, the Contractor and the supervising consultant during a tour of the dam

Picture/Courtesy/PIT

sustained cash flow. Speaking during the tour, Water Secretary Engineer Samwel A. O. Alima, who is also the project engineer, reiterated the commitment from the Ministry adding that the Dam has so far recorded huge progress. Makeni County Commissioner, Henry Wafula, urged the contractor to hasten work.

The Government of Kenya (GOK) through the State Department for Water and Sanitation, with funding from African Development Bank (AfDB) is implementing Thwake Multipurpose Water Development Program Phase 1.

This is a flagship program under Vision 2030 of the Government of Kenya whose overall objective is to fulfill the long-term country's development ambition in the areas of water, energy and agriculture, and a key project under the Bottom Up Economic Transformation Agenda (BETA). It will also provide regulation of flows on River Athi downstream of the Dam for flood control and drought mitigation. The program under which the project is being implemented, has four phases namely:

Construction of an 80.5 m high multi-purpose dam with storage capacity of 688 million cubic meter and associated preliminary works located one kilometer downstream of the confluence of Thwake and

Athi Rivers. A concrete-faced embankment dam covering an area of 9,217 acres, with a catchment spanning about 10,276 km². It will also see development of Water Supply, Sanitation and Waste Water Infrastructure to supply estimated 150,000 m³/day of treated water to approximately 1.3 million people drawn from the rural areas of Kitui and Makeni Counties and Konza Techno City in Machakos County.

Another phase comprises the development of a hydropower generating system with an installed capacity of approximately 20 MW and development of an Irrigation Scheme to ultimately irrigate 40,000 hectares (approx. 100,000 acres) of land. The contractor's scope of works entails construction and installation of concrete faced rock fill dam, main and emergency spillway, low level outlet, intake tower, access roads, hydro mechanical plant, electrical and mechanical plant, access road over the dam connecting Kitui and Makeni counties and employer's camp.

Present during the tour were Program Coordinator, Eng. David Onyango, Ag. Senior Resident Engineer, Dr. Negede Kassa, Engineer's Representative, Nicholas Rowse the contractor and a section of project staff.

Zachariah is a Graduate Trainee, Instrumentation Department



Progress of Dam's civil works impressive, says Water CS Njeru during tour

By Thwake Dam Journal Reporter

The Government is impressed with the progress made in the construction of first phase of Thwake Multipurpose Dam, Water Sanitation and Irrigation Cabinet Secretary Zacharia Njeru has stated.

Speaking during a tour of the facility earlier this year, the CS however directed the contractor – China Gezhouba Group Corporation (CGGC) and the Supervising Consultant, Snowy Mountains Engineering Corporation (SMEC) to speed up the works and address all the pending issues affecting the seamless completion of the Dam.

“The progress is impressive and encouraging. The government will be supportive to safeguard billions of taxpayers money being pumped into this mega project,” the CS said. He commended the contractor for doing a good job amid challenges from Covid-19 and the rise in cost of most of the materials.

“I believe the contractor was well-vetted and won the tender because he had the capacity, thus there should be no hiccups,” he added.

Thwake Multipurpose Dam is being constructed in the Lower Eastern region of the country covering Makueni, Machakos and Kitui counties. This mega project funded by the Government of Kenya and the African Development Bank (AfDB) is progressively moving towards completion

of the first phase which involves construction of an 80.5 m high multi-purpose dam with storage capacity of 688 million cubic meter and associated preliminary works located one kilometer downstream of the confluence of Thwake and Athi Rivers.

Makueni Deputy Governor Lucy Mulili said they are excited about the project because it will boost socio-economic empowerment of residents.

Makueni MP Susan Kiamba applauded the national government for the frequent visits to the site to ensure works were progressing well.

However, she urged that funds be made available for the second phase that involves water supply, sanitation and wastewater infrastructure to supply an estimated 150,000m³ per day of treated water to approximately 1.3 million people, and for the third phase of hydropower generation. Kiamba advised residents to be proactive and make plans to benefit from the Dam she described as is a game changer.

The CS was accompanied by Principal Secretary, State Department for Water and Sanitation Julius Korir, Water Secretary Eng. Samuel Alima, a team from the Ministry of Water, Sanitation and Irrigation and the Program Implementation Team (PIT).



At Thwake Multipurpose Dam, we heed the government's clarion call to plant at least 15 billion trees by 2032, a move aimed at reducing greenhouse emissions, stopping and reversing deforestation and restoring 5.1 million hectares of deforested and degraded landscapes.

Fostering peaceful
coexistence:

Managing human-wildlife conflict at Thwake Dam Project

By *Vallary Mituka*

The Thwake Multipurpose Water Development Program represents a significant step forward in Kenya's water management and hydroelectric power aspirations. Amidst the promises of economic growth and improved livelihoods, the project confronts challenges, particularly in areas rich in diverse wildlife.

Situated within an ecosystem inhabited by hippos and crocodiles, the Thwake Dam Construction Project epitomizes the nuanced balance required to coexist peacefully with wildlife amidst infrastructure development.

Human-wildlife conflict arises when human and wildlife interests collide, often resulting in adverse outcomes for both parties. At the Thwake Dam Construction Project, the presence of hippos and crocodiles presents significant hurdles. These animals, integral to the local ecosystem, are compelled to interact with human settlements due to ongoing construction activities.

Regular review of the Environmental and Social Impact Assessment (ESIA) report is crucial as it ensures that the planned project aligns with changing environmental and social dynamics. Circumstances evolve, and a periodic review helps in identifying any deviations from the initial assessment, enabling timely corrective measures. Furthermore, a comprehensive review enhances project sustainability, minimizes adverse impacts, and fosters continued harmony between human activities and the environment.

Legal consequences on harming wildlife

In Kenya, harming hippos or other wild animals is a serious offense with legal consequences. The country has stringent laws and regulations in place to protect its wildlife, including hippos, and those found guilty of harming or killing them can face severe penalties. Under Kenyan law, harming, killing, or poaching hippos or other protected wildlife species is illegal and punishable by



fines, imprisonment, or both. The Wildlife Conservation and Management Act of 2013 outlines strict penalties for offenses related to wildlife conservation. Offenders can face fines of up to millions of Kenya shillings and lengthy prison sentences.

The Kenya Wildlife Service (KWS) is the government agency responsible for enforcing wildlife protection laws in the country. They conduct patrols, surveillance, and anti-poaching operations to safeguard wildlife populations and apprehend perpetrators.

In cases of human-wildlife conflict involving hippos, efforts are made to mitigate conflicts through non-lethal means. This includes the use of deterrents, such as fences, trenches, or noise-making devices, to prevent hippos from encroaching on human settlements or farmland.

While the concept of animal rights may not be explicitly codified in Kenyan law, there is growing recognition of the importance of animal welfare and ethical treatment of animals. Many conservation organizations and advocacy groups in Kenya advocate for the humane treatment of animals and the protection of their habitats.

Just as human beings have rights, there is a growing acknowledgment of the intrinsic value of animals and the need to afford them certain protections. This perspective is reflected in efforts to conserve wildlife and ensure their welfare, recognising that animals have their own interests and rights to live free from harm and exploitation.

Overall, harming hippos or other wild animals in Kenya not only carries legal consequences but also reflects ethical considerations regarding the rights and welfare of animals. Through stringent enforcement of wildlife protection laws and efforts to promote coexistence between humans and wildlife, Kenya aims to conserve its rich biodiversity for future generations.

Strategies for peaceful coexistence as often implemented by the project team

Research and Monitoring: Kenya Wildlife Service (KWS) rangers have been stationed onsite to oversee inhabited areas following unsuccessful hippo relocations. Emphasis is placed on prioritising harmonious coexistence with wildlife and conducting continuous monitoring efforts.

Beyond basic research, ongoing monitoring aims to comprehend hippo and crocodile behavioural patterns, movement dynamics, and habitat requirements, informing effective mitigation strategies.

Community Engagement and Education: The Community Liaison team, in tandem with local leadership, orchestrates community engagement sessions featuring KWS rangers to enhance awareness on wildlife conservation and human-wildlife conflict risks.

These educational initiatives equip residents with knowledge and skills for fostering peaceful coexistence with hippos, crocodiles and other animals.

Infrastructure Development: Residents near the Dam are advised to construct trenches or sturdy chain-link fences to deter hippos from property damage. Additionally, the contractor educates workers on hippo attack risks and ensures adequate lighting and transportation facilities, particularly during nocturnal operations.

Future projections post-dam completion

Long-Term Monitoring and Evaluation

Consideration is given to establishing a permanent Kenya Wildlife Service camp post-completion, anticipating heightened human-animal conflicts from potential hippo dam incursions. A comprehensive monitoring plan assesses the dam's impacts on wildlife populations and habitats, employing adaptive management strategies to address emerging challenges. This includes monitoring the migration patterns of birds and other animals, assessing changes in ecosystems, and evaluating the effectiveness of mitigation measures.

Stakeholder Collaboration

Collaboration among government agencies, NGOs, communities, and stakeholders is pursued to implement integrated conservation and development initiatives. Collective endeavors are pivotal for sustainable development and biodiversity conservation. Stakeholders will work together to address issues such as habitat loss, human-wildlife conflict, and ecosystem degradation, ensuring that the benefits of the dam project are balanced with the conservation of natural resources.

Alternative Livelihood Initiatives

In addition to tourism and fishing, the Dam project opens avenues for alternative livelihood initiatives such as crocodile farming. Crocodile farming can provide a sustainable source of income for local communities while promoting the conservation of crocodile populations. The migration of birds and other animals to the Dam area can also create opportunities for ecotourism, further boosting economic activities in the region. Additionally, the improved ecosystems resulting from the Dam's construction may attract a variety of wildlife, including gazelles, antelopes and other animals, leading to enhanced biodiversity and ecosystem resilience.

However, it's important to note that the influx of water may also attract snakes seeking water sources. While some of these may be common species, the filling of the Dam could also lead to the discovery of unique species previously unknown in the area. Comprehensive monitoring and management plans will be essential to ensure the sustainable coexistence of humans and wildlife in the post-dam completion phase.



FACTS ABOUT HIPPOS

- Habitat:** Hippos are primarily found in sub-Saharan Africa, inhabiting rivers, lakes, and swamps.
- Diet:** They are herbivores and mainly feed on grass, consuming large quantities each night.
- Size:** Hippos are one of the largest land mammals, with adult males weighing up to 3,200 kilograms (7,000 pounds) and females slightly smaller.
- Aggressive Behavior:** Despite their herbivorous diet, hippos are considered one of the most aggressive animals in Africa. They are known to be territorial and can become extremely aggressive, especially when defending their territories or young.
- Social Structure:** Hippos are social animals and live in groups called colonies, pods or schools. These groups can consist of up to 30 individuals, typically led by a dominant male.
- Semi-Aquatic:** While hippos spend most of their time in water to keep cool and protect their skin from the sun, they are not fully aquatic. They can often be found grazing on land at night.
- Conservation Status:** Hippos are classified as “vulnerable” by the International Union for Conservation of Nature (IUCN) due to habitat loss, hunting, and human-wildlife conflicts.
- Threats to Humans:** Hippos are responsible for more human deaths in Africa than any other large animal. Despite their seemingly docile appearance, they can be unpredictable and territorial, making them dangerous to humans, especially in areas where their habitats overlap with human settlements.
- Reproduction:** Female hippos give birth to a single calf after a gestation period of about 8 months. The calves are usually born underwater and can swim almost immediately.
- Ecological Importance:** Hippos play a crucial role in their ecosystems by shaping the landscape through their feeding habits and providing nutrients to aquatic environments through their waste.

IF YOU SPOT A HIPPO IN THE WILD, IT'S IMPORTANT TO TAKE THE FOLLOWING PRECAUTIONS:

- Maintain Distance:** Keep a safe distance from the hippo, as they can become aggressive if they feel threatened. It's advisable to stay at least 50 meters (approximately 164 feet) away from them.
- Avoid Encroaching on Their Territory:** Hippos are territorial animals, and they can become defensive if they feel their space is being invaded. Therefore, avoid getting too close to their habitat or crossing into their territory.
- Move quietly and slowly:** If you're observing hippos from a distance, try to move quietly and avoid making sudden movements. Sudden noises or movements may startle them, triggering defensive behavior.
- Do Not Startle or Provoke Them:** Avoid any actions that may startle or provoke the hippo, such as making loud noises, throwing objects, or approaching too quickly. Stay calm and composed to minimise the risk of aggression.
- Stay Vigilant:** Keep a lookout for any signs of aggression or agitation in the hippo's behavior, such as vocalisations, ear flicking, or posturing. If you notice any warning signs, slowly and calmly move away from the area.
- Respect Their Space:** Remember that hippos are wild animals, and it's essential to respect their natural behaviour and habitat. Avoid disturbing them or attempting to interact with them in any way.
- Seek Guidance from Experts:** If you're in an area known for hippo encounters, it's a good idea to seek guidance from local wildlife experts or guides. They can provide valuable insights on how to safely observe hippos and navigate their habitat.

By following these precautions and maintaining a respectful distance, you can safely observe hippos in their natural environment while minimising the risk of confrontation or injury.

Vallary is a Graduate Trainee, Environment, Health and Safety



Thwake Multipurpose Dam progresses to completion as Water Secretary Eng. Alima directs the Contractor to accelerate works

By Eng. Shadrack Yego

Water Secretary Engineer Samuwel A.O. Alima, EBS, has put to task the Thwake Dam contractor to ensure the ongoing works for Phase One are completed within the scheduled time.

Speaking recently during a site inspection tour of the Vision 2030 project, being constructed on the border of Kitui and Makueni counties, Eng. Alima, directed the contractor – China Gezhouba Group Company Limited – the Chinese conglomerate tasked with the construction of the multi-billion water facility, to stick to the programme of works which accurately details timelines.

“Let us all nurture the project to completion. We don’t have time and must burn the mid-night oil as we head towards completion,” he said of the project expected to supply water to at least 1.3 million people drawn from the rural parts of Makueni, Kitui and parts of Machakos counties.

The construction of the dam civil works and other related activities is ongoing and at an advanced stage. So far, huge progress has been recorded in key areas such as ongoing embankment dam filling, spillway, water intake tower, employer’s camp, upstream and downstream coffer dams, which have since been completed and operational. During the meeting, Eng. Alima, who is also the Project Engineer, instructed that the contractor must mobilise on key areas

like the Dam embankment, water intake tower, tunnels, bridge and the spillway to ensure that works are completed as the completion date nears.

The site inspection visit saw him take a comprehensive tour of some of the facility’s salient components before holding an in-depth meeting with the officials from the supervising consultant – SMEC, the contractor and the Program Implementation Team (PIT). The tour was one of the routine monthly inspections Eng. Alima normally carries out at the project.

The Government of Kenya and the African Development Bank (AfDB) through the Ministry of Water, Sanitation and Irrigation is implementing this flagship program to fulfill the long-term country’s development ambition in the areas of water, energy and agriculture.

The program comprises a multi-purpose dam for water supply, hydropower generation and irrigation development. It will also provide regulation of flows on River Athi downstream of the Dam for flood control and drought mitigation.

The implementation of the Dam civil works and other related activities is currently ongoing.

Eng. Yego is the Program Engineer

How pollution will be controlled at Thwake Dam



01

First Step

Induction of Water Resources Users Association (WRUAs) as stakeholders to the sediment load consultant's report in the upstream catchment of Thwake Dam (Kiambu, Nairobi and Kibwezi sub-basin areas)



02

Second Step

Construction of 50 sand dams, 20 weirs and 36 check dams



03

Third Step

Implementation of conservation activities such as gabions, terraces and tree planting among others, in targeted areas



04

Fourth Step

Spring protection – springs to be protected in Maruba, Itetani, Yandue Mbanya (Kangundo, Kawethei and Kathaana sub catchments)



05

Fifth Step

Development and review of 20 Strategic Catchment Management Plans for WRUAs in Mbuuni, Ithaeni, Kithangaini, Lumbwa, Mueetha, Kyanzonzo, Kaiti Kambi, Upper Kaiti, Kiumi, Lauka, Uaani, Mivukoni Kyambuli, Yandue Mbanya, Ngutwa Nduenguu, Mwambani, Kikuu, and Utangwa

Measures put in place from upstream all the way to downstream



Sixth Step

06

Establishment of 11 WRUAs in zones where there are no WRUAs



Seventh Step

07

Sensitization, awareness creation and capacity building of WRUAs and stakeholders on catchment conservation, riparian and wastes management (liquid, solid), and circularity approaches



Eighth Step

08

Installation of two automatic stations (Wamunyu and Mavindini) and two telemetric stations (Ondiri and Kibuon) for water quality monitoring along the Athi River; Rehabilitation of two telemetric stations (Boulevard and Munyu)



Ninth Step

09

Quarterly comprehensive focused monitoring (heavy metals, pesticides sediment load and other pollutants) within Thwake catchment



Tenth Step

10

Abstraction and pollution survey and water allocation plan for Athi and Thwake Rivers (Kaiti River, Thwake Kalawa, Ndarugu) – which will consider the following sub catchments Mbuuni, Ithaeni and Kithangaini along Ithaeni River tributary to Thwake, Kiumi/Masii along Thwake River, Kaiti Kambi (Wote town area) along Kaiti River, Mukio Thwake along Thwake River d/s of Thwake & Mukio Rivers, Ndarugu and Ruiru Rivers

How Thwake Multipurpose Water Development Program fosters cultural integration with Chinese

By Mercy Mueni

The Thwake Dam Program, under the Chinese contractor China Gezhouba Group Limited (CGGC), has become a hub for cultural integration. Despite differing national holidays between China and Kenya, the project has provided a platform for mutual cultural exchange. This year, the consultant's community liaison officers collaborated with CGGC to celebrate Chinese Lei Feng Day.

Lei Feng Day, observed annually on March 5th in China, commemorates Lei Feng, a young soldier in the People's Liberation Army renowned for his selflessness, dedication, and service.

Born on 18th December 1940, in Wangcheng, Hunan Province, Lei Feng overcame early hardships to become a symbol of altruism. His untimely death at the age of 21, due to a work accident, led to the discovery of his diary, which chronicled his daily acts of goodwill and commitment to communist ideals.

In 1963, Chairman Mao Zedong launched a campaign to promote Lei Feng's spirit, calling on the Chinese people to "Learn from Comrade Lei Feng". This transformed him into a national icon, symbolising altruism, volunteerism, and national unity.

Significance of Lei Feng Day

Lei Feng Day serves to do the following:

- *Promote Altruism and Volunteerism:* Encouraging acts of kindness and community service.
- *Educate in Communist Values:* Instilling values such as collective effort and self-sacrifice.
- *Celebrate Cultural and Historical Significance:* Honoring Lei Feng as a cultural icon.
- *Foster National Unity and Moral Example:* Reinforcing moral integrity.

Cultural interaction with the local residents

Over the years, Lei Feng Day has evolved, yet its core message remains vital. It is marked by community service, educational programs, and public commemorations. Through Thwake Dam, commemoration was done at the Kathonzweni Small Home in Makueni Constituency. This is a safe haven for differently abled children, some with delayed milestones or some who have faced painful life circumstances. The Chinese counterparts brought food

stuff and stationery items for the students and cooked a Chinese delicacy for lunch. This year's Lei Feng Day was celebrated at Kitoto Secondary School in Mbooni Constituency, where students engaged with representatives from CGGC and SMEC, the supervising consultant. The top 50 performing students received geometrical sets, stationery items, and sanitary towels for girls and the rest of the students got pens and pencils.

Interactive activities

The exercise also saw some interactive activities such as Chinese language and writing, where learners were introduced to basic Chinese phrases and characters, with a workshop on writing names in Chinese.

The day was also marked with celebration of Chinese cuisine where participants explored Chinese dishes through cooking demonstrations and tastings, Chinese festivals and celebrations which was marked by learning about festivals like Chinese New Year, Mid-Autumn Festival, and Dragon Boat Festival.

Other activities included learning about Chinese history and architecture where learners discussed dynasties and landmarks such as the Great Wall and Forbidden City, Chinese traditional medicine where concepts like herbal remedies and acupuncture were discussed.

Other areas included Chinese martial arts marked by demonstrating Tai Chi, Taekwondo, Kung Fu, and Wushu, cultural similarities and differences where the CGGC encouraged dialogue to explore cultural values and traditions, cultural etiquette and customs, future career opportunities and education exchange where the students were informed about career paths and international collaboration opportunities, environmental conservation and sustainable development.

Mentorship session

The events concluded with a mentorship session. The mentorship program aimed to instil essential life skills and values crucial for the personal, academic, and professional development of the students. Commencing with career guidance sessions, seasoned mentors from diverse backgrounds shared their insights, enabling the youth to explore various career pathways. They were encouraged to identify their passions and align them with potential career opportunities, fostering a sense of purpose and direction.

Addressing prevalent issues such as school dropouts, teenage pregnancies, and substance abuse, the youth were advised to exercise self-discipline and prioritise their education. The School's principal and the whole fraternity expressed gratitude for the initiative and requested future sessions to be organised to monitor the academic progress and positive transformation and continuation of cultural interaction with the contractor.

Mercy is a Graduate Trainee, Community Liaison Department

A glimpse at The People's Republic of China

- **Capital City:** Beijing
- **Ancient Civilization:** China is one of the world's oldest civilizations, with a history that spans over 5,000 years.
- **The Great Wall:** The Great Wall of China, one of the most famous landmarks, is over 13,000 miles long and took more than 2,000 years to complete.
- **Population:** China is the 2nd most populous country in the world, with a population exceeding 1.4 billion people, over 300 languages with 56 ethnic groups.
- **Dragon Boat Festival:** The Dragon Boat Festival, celebrated on the fifth day of the fifth lunar month, features dragon boat races and eating zongzi (sticky rice dumplings).
- **Chinese Zodiac:** The Chinese Zodiac is a 12-year cycle, with each year represented by an animal. The cycle includes the rat, ox, tiger, rabbit, dragon, snake, horse, goat, monkey, rooster, dog, and pig.
- **Chinese New Year:** Also known as the Spring Festival, Chinese New Year is the most important holiday in China, marked by family reunions, feasts, and fireworks. N.B – Chinese have no Christmas holiday.
- **Terracotta Army:** Discovered in 1974, the Terracotta Army consists of over 8,000 life-sized soldiers and horses buried with China's first Emperor, Qin Shi Huang, to protect him in the afterlife.
- **Cuisine:** Chinese cuisine is incredibly diverse, with each region having its own distinctive flavours and dishes. Popular dishes include Peking duck, dumplings and hot pot. The use of chopsticks in China dates back over 3,000 years, originating during the Shang Dynasty.
- **Tea Culture:** China is the birthplace of tea, and tea drinking is an integral part of Chinese culture, with many different varieties like green tea, black tea, and oolong tea.
- **Mount Everest:** The north side of Mount Everest, the world's highest peak, is located in Tibet, an autonomous region of China.
- **Inventions:** China is home to the world's fastest train, the Shanghai Maglev, which can reach speeds of 431 km/h (268 mph). Many significant inventions originated in China, including papermaking, printing, gunpowder, and the compass etc.
- **Unique Wildlife:** China is home to the giant panda, a national symbol and a beloved animal known for its distinctive black and white fur. There are other unique wildlife species such as the Chinese alligator, the South China tiger, and the red panda.



1. Contractor and consultant presenting gifts to the students in Kitoto Secondary school
2. Celebrating Lei Feng Day and mentoring students at Kitoto secondary school
3. Kitoto Secondary School fraternity, CGGC and SMEC representatives in Mbooni Constituency celebrating Lei Feng Day

Pictures/Courtesy/PIT



Powered by Dams: A young engineer's inspiration to Thwake Multipurpose Dam

By Robert Ngiire

In high school, I was fortunate to visit the Masinga and Kamburu dams in the Eastern region of Kenya on a physics trip. Standing in the instrumentation and hydromechanical control rooms of these grand structures, I felt a spark of interest in pursuing a career in engineering.

The history of these dams, constructed in the 1960s, made me realise how rare and significant such opportunities were. Little did I know that the fire ignited in those rooms would one day light up my career path.

A decade later, after earning my BSc in Mechatronic Engineering, I find myself as a graduate trainee engineer at the Thwake Multipurpose Water Development Program – the largest of its kind in Kenya which is a concrete face rock fill dam (CFRD).

This opportunity has been made possible by the Government's Knowledge Transfer Program through the Ministry of Water, Sanitation and Irrigation.



The writer at the view near the spillway

Picture/ Courtesy/PIT

Under this program, I have gained invaluable experience working in two departments:

Tunnels and Structure

Departments: Here, I've had hands-on experience with tunnels and hydromechanical structures, such as intake tower guard gates, penstocks for irrigation and water treatment, and access adit hydromechanical structures. My involvement in physical Site Acceptance Tests (SAT) and virtual Factory Acceptance Tests (FAT) has provided me with extensive knowledge and experience. Briefly, FAT is a process of testing equipment or components, such as guard gates and actuators, performed at the factory before and after assembly to verify that the components or facilities are made according to the relevant standards and specifications while SAT is the testing acceptance test of equipment and check of relevant documentation at the site of use of the equipment.

Instrumentation department:

In this department, I have actively participated in the installation and inspection of various instrumentation devices. These include horizontal and internal settlement gauges for monitoring the dam's horizontal and vertical movements, piezometers for pore pressure monitoring, and fibre optic loops for dam seepage monitoring among others. These instruments collectively ensure dam safety is monitored during both construction and service periods. Throughout this journey, I have been guided by professional engineers who have supervised my progress and helped me through the registration process as I pursue my professional engineer status.

Additionally, I have had the privilege of being mentored by international dam experts, whose guidance and expertise have been invaluable.

One of the most rewarding aspects of this project has been witnessing the collaboration between different departments, all working towards the common goal of building a mega dam to provide water for the community. This collective effort underscores the importance of teamwork in achieving monumental projects.

Beyond my engineering duties, I have been actively involved in mentorship programs organized by the project's Community Liaison Department. Mentoring students from schools surrounding the project area has revealed a new passion for mentorship within me. These experiences have been incredibly fulfilling and have enriched my journey. This entire experience has been made possible by the Government of Kenya's commitment to the Knowledge Transfer Program. I hope such initiatives are implemented in all government projects to equip graduates with hands-on experience in their respective fields.

I am also immensely grateful to the SMEC engineers who have tirelessly trained and inspired us to embody resilience and the virtue of hard work. So far, I have been able to register with both Engineering Board of Kenya (EBK) and Institute of Engineers Kenya (IEK) as a Graduate Engineer with the help of the registered engineers in the project. I don't think I would have got such a headstart were it not for Thwake Mega Dam Project. I am now working on registration as a professional engineer with the EBK.

I eagerly anticipate the day I can take my children to visit Thwake Dam on a school trip, proudly showing them the "I was here" photos. Being part of this historic mega project is profoundly fulfilling, and I am excited to see its lasting impact on our community and country.

Robert is a Graduate Trainee Engineer





AfDB Supervision Mission urges Thwake Dam builders to expedite completion

By Godfrey Olali

A supervision mission by the African Development Bank (AfDB) has urged the builders of Thwake Multipurpose Dam being constructed at the borders of Makueni and Kitui counties to expedite completion of the first phase of the multi-billion water reservoir facility as per the stipulated timelines.

Speaking recently during a site appraisal tour of the dam – poised to uplift millions of lives in the Lower Easter region – the mission led by Thwake Multipurpose Water Development Program Task Manager at the Bank, Ms. Nancy Ogal, directed that the stipulated 8th December 2024 timeline for the construction works for phase 1 must be met.

“We must close all the pending non-compliance reports (NCRs) in good time since delays will impact on the projected timelines,” said Ogal who urged the Contractor, the supervising Consultant and the implementation team

to furnish the lender with all the challenges being faced. She added that the Bank will also engage the high-level leadership at the Ministry of Water, Sanitation and Irrigation to come up with strategies on how to address the bottlenecks which are delaying the implementation.

The objective of the Mission was to monitor the program implementation status following the desk supervision that was undertaken in December 2023. The Mission also discussed outstanding issues that are impacting smooth implementation of the Program, with a view to identifying and agreeing on remedial actions for the efficient implementation going forward.

The AfDB mission also included Eng. Emily Kilongi, a water and sanitation specialist, David Gacheru, a procurement specialist, Vitalis Too, an environment and safeguards officer and Dr. Winnie Wairimu, an environment and social safeguards officer.

During the visit, the Mission was taken through presentations by the Program Implementation Team (PIT) and the supervising consultant – Snowy Mountains Engineering Corporation (SMEC). It was also noted that the project has made significant progress in some of its salient features including tunnel A, B, bypass tunnel, low level outlet, intake tower, spillway and embankment dam. Water Secretary Eng. Samwel Alima, while addressing the Mission, promised that the Ministry was keen in ensuring the timelines are met.

The presentations also focused on areas such as program procurement, physical works, financial management, gender and social development, environment, health and social safeguards, monitoring and evaluation, communication and publicity. The Mission which was also expected to hold discussions with the Government on downstream phases, added that the Bank was keen to finance the three remaining phases.

The contractor's scope of work entails construction and installation of a concrete faced rock fill dam, main and emergency spillway, low level outlet, water intake tower, access roads, hydro mechanical plant, electrical and mechanical plant, access road over the dam connecting Kitui and Makueni counties and employer's camp.

The Government of Kenya (GoK) through the State Department for Water and Sanitation, with funding from

the African Development Bank (AfDB) is implementing the first phase of Thwake Multipurpose Water Development Program. This is a flagship program under Vision 2030 of the Government of Kenya whose overall objective is to fulfil the country's long-term development ambition in the areas of water, energy and agriculture. It is also a key project under the Bottom Up Economic Transformation Agenda (BETA) that will provide regulation of flows on River Athi downstream of the dam for flood control and drought mitigation.

The program under which the project is being implemented has four phases including construction of an 80.5 m high multi-purpose dam with storage capacity of 688 million cubic meter and associated preliminary works located one kilometre downstream of the confluence of Thwake and Athi Rivers. A concrete-faced embankment dam covering an area of 9,217 acres, with a catchment spanning about 10,276 km².

Development of water supply, sanitation and waste water infrastructure to supply estimated 150,000 m³/day of treated water to approximately 1.3 million people drawn from the rural areas of Kitui and Makueni Counties and Konza Techno City in Machakos County, development of hydropower generating system with an installed capacity of approximately 20 MW and development of an irrigation scheme to ultimately irrigate 40,000 hectares (approx. 100,000 acres) of land.





PAMOJA TUANGAMIZE UKIMWI

PAMOJA TUANGAMIZE UKIMWI



Women drawn from Kanyangi sub-location in Kitui Rural area, reading IEC materials during a past health communication campaign.

Hakuna M

Beacon of sustainable infrastructure development: Debunking the engineering complexities about CFRD dams

By Christine Osano



Thwake Multipurpose Water Development Program in Kenya stands as a beacon of sustainable infrastructure development, embodying a confluence of advanced engineering practices and meticulous planning. Among the critical elements underpinning this project, is the field of geotechnical engineering, particularly in the construction of the Concrete Face Rockfill Dam (CFRD).

Understanding Concrete Face Rockfill Dams

CFRDs are a type of embankment dam wherein the upstream face is made of concrete. This design leverages the strength of concrete for impermeability and the mass of rockfill for stability. CFRD was chosen for its cost-effectiveness due to the availability of construction material within the site location.

The Geotechnical Engineering Perspective

Geotechnical engineering is the bedrock of CFRD design and construction. It involves the study of soil and rock mechanics to ensure the dam's foundation is stable and capable of supporting the structure throughout its lifespan. Key geotechnical considerations in the Thwake CFRD include site investigation, geotechnical analysis, foundation treatment, and the mechanical behavior of rockfill.

1. Site Investigation

The primary objective of the site investigation is to gather comprehensive data about the geological, hydrological, and geotechnical conditions at the dam site. This data is essential for designing a stable and secure foundation for the dam. This phase involves thorough geological surveys and mapping, borehole drilling and sampling for soil testing to determine the composition, strength, and stability of the foundation material and hydrological studies to evaluate

groundwater conditions, and flow patterns, which influence seepage behavior and foundation stability. This data is crucial for designing a dam that can withstand various forces and operational loads.

2. Geotechnical Analysis

Geotechnical analysis in CFRD involved assessing the behavior of rockfill materials, concrete facing, foundation and interactions between them to ensure the dam's stability, safety and longevity. It includes factors like, material properties, stability analysis, seepage control and deformation monitoring.

3. Foundation Treatment

Based on the site investigation findings, foundation treatment methods are implemented to enhance stability. This includes grouting to fill voids and fractures to prevent seepage. The goal is to create a homogenous, impermeable foundation that minimizes the risk of differential settlement and seepage. To begin with a pilot bore hole (PBH) is drilled and a water pressure test (WPT) conducted to obtain the Lugeon values which defines the permeability of the ground. Consolidation grouting is then done and aims at increasing the bearing capacity of the foundation rock. The consolidation holes are shallow holes compared to curtain holes. The procedure is followed



by curtain grouting whose main role is to control seepage of water with depths reaching 90m.

Once grouting is completed, the effectiveness of the grouting works is confirmed via an inclined check bore hole (CBH) where WPT are done and works are satisfactory when Lugeon values <3 are achieved. If the Lugeon values are >3 , additional curtain holes are grouted and the CBH redone. In addition, where grout take of the curtain tertiary hole in a panel was greater than $100\text{kg}/\text{m}^3$, the CBH depth was increased by 5m to ensure adequate checks.

4. **Rockfill Mechanics and Material Testig**

The rockfill used in CFRDs must be carefully selected and placed to ensure structural integrity. Geotechnical engineers design the gradation and compaction processes to optimize the rockfill's mechanical properties, ensuring it can adequately support the concrete face and withstand internal and external stresses. The rockfill material for the dam embankment is divided into zones; 1A, 1B, 2A1, 2A2, 2B, 3A, 3B and 3C.

Some of the material test done on rockfill material include: gradation, FDT, in-situ permeability test, relative density, clay content, LAA, Compressive

strength of blasted material, and soundness tests among others. Other material tests done in the dam involve; tests for concrete works and grouting material tests.

The Thwake Advantage

In the Thwake Multipurpose Water Development Program, geotechnical engineering has been integral from the outset. Comprehensive site investigations identified the optimal location for the dam, minimizing risks associated with geological hazards while optimizing costs due to the availability of the rockfill material within the site. Advanced foundation treatment techniques have been applied to ensure stability and durability. Furthermore, meticulous rockfill selection and placement have been executed to enhance the dam's resilience.

The successful implementation of geotechnical engineering principles in the Thwake CFRD exemplifies how meticulous planning and scientific rigor can lead to the creation of robust and reliable infrastructure. As the Thwake Multipurpose Water Development Program progresses, it will continue to serve as a model for similar developments in Kenya, demonstrating the indispensable role of geotechnical engineering in the realm of dams.

Christine is a Graduate Engineer-Materials



The essence of dam safety monitoring

By Zacharia Mungai

Dam safety monitoring programs consist of collecting data from visual observations and instrumentation and evaluating the data with respect to dam performance and safety.

Visual observation consists of the thorough inspection of conditions of the dam and appurtenant structures, noting any unusual conditions that could jeopardize the safety of the Dam.

Instrumentation consists of the various electrical and mechanical instruments or systems used to measure pressure, flow, movement, stress, strain and temperature. Monitoring is the collection, reduction, presentation, and evaluation of the instrumentation data.

Purpose: The purpose of dam monitoring is to maintain and improve dam safety by providing information on whether the dam is performing as expected and also warn of any changes that could endanger

the safety of the dam. There are a variety of instruments that have been designed and installed, others are being installed and others will be installed later as the construction progresses in order to measure, record and calculate data during the construction period of the concrete face rock fill dam (CFRD), during impounding and after impounding. The instruments installed can be categorized according to the design purposes which includes; seepage monitoring, displacement monitoring, deformation monitoring and also meteorological monitoring.

Monitoring sections: There are different sections across which monitoring is required which includes the internal plinth, the dam body, the tunnels, tunnels slopes, spillway weir, spillway slopes and cofferdam. Instruments installed at the spillway section includes; thermocouples for measuring concrete temperature during concrete placement, vibrating wire piezometers for measuring seepage and extensometer for

measuring deformation. Instruments installed on the Dam includes the pneumatic piezometers, vibrating wire piezometer, optical fiber loop, standpipe piezometers, hydraulic settlement cells, horizontal movement gauges, survey monitoring pins, settlement plates. Instruments installed at the tunnels include but are not limited to the crack meters, pressure cells and vibrating wire strain gauges.

Installation process: During installation, two main methods are used which includes excavation and drilling. Excavation is done to the desired elevations and material placement is done according to design and compaction is done after applying the recommended amount of water. The instrument is carefully laid and placement materials is done according to design, then water is applied and compaction is done. Drilling involves the use of desired bit to make the boreholes according to the design depth then installation of the various instrument is done.

Displacement monitoring: As the construction of the CFRD progresses, vertical displacement (settlement) and horizontal displacement will occur due to increase in overburden weight, compaction and rainfall. As the settlement occurs, the stresses and the

strain for the fill materials in different layers and locations will change. These changes will be captured using the various displacement instruments installed, such as hydraulic settlement cells, horizontal movement displacement gauges, settlement plates and survey monitoring.

Hydraulic settlement cell: The cell itself is housed within a sealed container and operates using a U-tube and overflow principle. It is used in measuring the vertical movements. The frequency of data taking is on a daily basis for the first one week and then once per week during the construction period. The hydraulic settlement cells have been distributed across three chainages and at different elevations which are critical in order to capture the adequate data for vertical settlement data recording, analysis and interpretation.

For calculation purposes the settlement in the rock fill and that of the instrument observation room are recorded, then a summation of the two data is done and then graphically represented. The settlements obtained over a period of time is compared to those recorded during construction of other CFRD as well as the Thwake CFRD design specification. This information will thereafter be used to

determine the appropriate time of the placement of the concrete face.

Horizontal movement gauges: These are used to measure the horizontal displacement of the rock during construction of the Concrete Rock fill dam. The instruments are distributed across three chainages which are critical. The data taking is done on a weekly basis and once obtained the data is used to calculate the stiffness of the rock fill. The result obtained will be used to guide the construction team accordingly.

The settlement plates and the survey monitoring goes hand in hand: The settlement plates are installed across three chainage on the left bank. Survey data is recorded on a weekly basis which includes the coordinates and the elevation. The elevation obtained is compared to the previous week's data and interpreted either as a settlement or on rare cases as an uplift.

Seepage monitoring: Seepage is the interstitial movement of water through a dam foundation, or the abutments. Instruments used in measuring seepage includes the pneumatic piezometers, vibrating wire piezometers, self-heating optical fiber loops and standpipe

piezometers. The vibrating wire piezometer and the pneumatic piezometers have been installed on the dam body across three critical chainages and also along the internal plinth at different critical points in order to monitor the pore pressure during construction, impounding and after impounding. Pore pressure is the water pressure that is acting upwards on the base of the concrete dams commonly known as uplift pressure.

Water pressure usually varies from headwater level on the upstream side of the dam to tail water level, ground water level, or atmospheric pressure on the downstream side of a dam. The headwater, tail water, and varying pressure across the dam produce forces on a dam that must be accounted for in stability analyses.

By monitoring this pore pressures in dam structure in real time, the safety and stability of the Dam will be understood and the necessary measures taken where necessary in order to prevent any failure and also optimize the design. This will therefore ensure there is safe operation of the dam structure and the water reservoir.

Zacharia is a Graduate Trainee, Instrumentation Department



How Thwake Dam will be an instrument of peace and development

By Godfrey Olali

According to statistics from *Down-to-Earth* publication, at least 1,473 instances of water-related violence and conflicts have been reported worldwide between 1990 and 2023. Another data released by US-based non-profit Pacific Institute in December 2023, indicates that over 72 per cent of these incidents occurred in 2014-23.

This means that about two-thirds of all water-related conflicts since 1990 occurred in the past decade. Drought and water stress linked to climate change has been a trigger behind rising conflicts in Africa. For instance,

in the disputes across sub-Saharan Africa—which includes countries such as Kenya, Burkina Faso, Mali, Ethiopia, Nigeria and Somalia—traditional herders and farmers continue to compete for scarce water resources.

Development of Thwake Multipurpose Water Development Program, will be a catalyst for peace and development for the three counties of Makueni, Kitui and Machakos. For example, development of water supply, sanitation and waste water infrastructure will be a great pillar for sustainable co-existence

between the residents in the three counties of Makueni, Kitui and Machakos.

According to experts at the Ministry of Water, Sanitation and Irrigation and the builders of the dam, once an estimated 150,000 m³/day of treated water to approximately 1.3 million people drawn from the rural areas of Kitui and Makueni counties get sustainable water supply, then this will mean that majority of residents will have supply and be able to get water for their animals thereby reducing conflicts of pastures and livestock watering areas.



Access to drinking water is a human right. There is an urgent need to work together to protect and conserve our most precious resource. Cooperation on water paves the way for cooperation on all shared challenges.

UN-Water

What can water do?

- **Water can** be a trigger when interests of different water users, including States and provinces, clash and are perceived as irreconcilable, or when water quantity or quality decreases, which may affect human and ecosystem health.
- **Water can** be a weapon during armed conflict – used by both State and non-State actors – as a means to gain or maintain control over territory and populations or as a means to pressurize opponent groups.
- **Water can** be a casualty of conflict when water resources, water systems or utility employees are intentional or incidental casualties or targets of violence. Attacks on civilian infrastructure, including water systems, pose serious health risks and violate international humanitarian law.
- **Water can** be a tool for peace. Over time, there have been many more incidences of cooperation than conflict over water, but there is much more to do. Peaceful cooperation around water – within and between countries – can pave the way for peaceful cooperation in all sectors.
- **Water can** be a stabilizing force and a catalyst for sustainable development. We must act upon the realization that water is not only a resource to be used and competed over – it is a human right, intrinsic to every aspect of life.

Development of hydropower generating system with an installed capacity of approximately 20 MW will create jobs and spur industrial growth through establishment of small holder industries. To enhance food security, the planned development of irrigation scheme to ultimately irrigate 40,000 hectares (approx. 100,000 acres) of land will ensure food security for the regions. This will enable the residents to partake of agricultural activities and be food sufficient reducing cases of conflict over food accessibility.

“Thwake Multipurpose Water

Development Program will see the creation of thousands of jobs, emergence of small-scale industries, boost to healthcare and sanitation, food security and irrigation. At the nearby shopping centers, already many businesses are booming with landlords also benefiting from rental incomes from workers working at the site,” notes Water Secretary Engineer Samuel Alima who is also the Project Engineer.

According to UN-Water, water can create peace or spark conflict. When water is scarce or polluted, or when people have unequal or no access,

tensions can rise. Access to drinking water is a human right. There is an urgent need to work together to protect and conserve our most precious resource. Cooperation on water paves the way for cooperation on all shared challenges.

“We must use water as a tool to create a more peaceful and prosperous world for all. Shortages of water lead to problems for agriculture and health implications as people are forced to use unclean sources, taking the time and energy of children to fetch water, affecting their education as well,” adds the report by UN.



To hold projects accountable for achieving gender inclusion, we are keen in building gender metrics into our project monitoring and evaluation initiatives. By taking cognizance of gender matters, we will break down barriers, challenge stereotypes, and build a dam where gender equality is the norm.





YOUTH MENTORSHIP

Thwake Dam's initiatives brings positive transformation for the young

By Alex Macharia



Thwake Dam Project, a monumental endeavor in Kenya, stands as a beacon of progress and development. Beyond its primary goal of addressing critical infrastructure needs, the project has taken significant strides in uplifting the younger generation through extensive mentorship programs.

These initiatives, driven by the project's Community Liaison Department and Graduate Trainee Engineers, have reached various schools and locations, leaving a profound impact on the lives of many students.

The Project represents a holistic approach to community empowerment, addressing not only physical needs but also nurturing the human potential.

With its current phase focusing on dam construction and future phases planned for water supply, electricity, and irrigation, the project promises significant benefits for the region.

By integrating mentorship programs into its framework, the Thwake Dam Project has positioned itself as a catalyst for positive change in the engineering sector and beyond. It is shaping the next generation of leaders, equipping them with

the skills, knowledge, and mindset needed to navigate the complexities of modern life successfully.

As we look forward to the completion of the construction phases, the ongoing commitment to youth mentorship stands out as a testament to the project's dedication to sustainable development. The positive impacts observed so far are just the beginning, promising a brighter and more empowered future for the youth and the community at large.

In the heart of Kenya, the Thwake Dam Project is not only reshaping the landscape with its infrastructure but also sculpting the future of its younger generation.

As the project unfolds, its impact extends far and beyond, reaching into schools and communities with a mission to inspire, educate, and empower the youth. Through fostering a new generation of well-rounded, motivated, and resilient individuals ready to take on the challenges of tomorrow.

Mentors from diverse backgrounds have often shared their insights during career guidance sessions, helping youth explore various career pathways and align their passions with potential opportunities. The

discussions have also addressed prevalent issues such as school dropouts, teenage pregnancies, and substance abuse, emphasizing self-discipline and prioritizing education.

Students are encouraged to set goals, seize academic opportunities, maintain a positive mindset, and develop resilience and timely decision-making skills. The interactive sessions and real-life examples motivated the youth to cultivate discipline and effective time management, understanding that success often requires dedication and perseverance. The Thwake Dam Project's mentorship programs are not just one-off events but part of a long-term vision to foster positive transformation in the community.

The community liaison officers and the project team have pledged to continue these efforts, reaching even more remote areas beyond the schools near the dam project.

These initiatives are not merely adjuncts to the construction efforts but are integral to the project's vision of sustainable development. By nurturing the youth, the project is investing in the human capital essential for Kenya's future growth.

Alex is a Graduate Trainee, Community Liaison



Engineering and welding skills



Data reading and recording

Knowledge Transfer

Thwake multipurpose dam is a source of employment for both local and international communities. Through this engagement employees from the local communities are equipped with the necessary skills which include welding, data reading and recording, and coordination of works, just to mention a few. The acquired skills will help them secure jobs in the future as they will be able to execute assigned tasks diligently. Thanks to this, the community members can improve their living standards and support their families through the remuneration earned at the end of every month. This source of employment has also helped improve the quality of life as they are engaged in the project thereby reducing their idle time which results in them not abusing drugs and other substances. A sober life helps them have better mental health leading to healthier families.



Better living standards



Skills in coordination of works



From Our Lens

1. Principal Secretary, State Department for Water and Sanitation Julius Korir (left), Makueni County Commissioner Henry Wafula (center) and Thwake Project Coordinator Eng. David Onyango during a tour of the site. **2.** A team from the Contractor, China Gezouba Group Company (CGGC) at the site. **3.** The Project Manager, CGGC Li Shan, plants a tree at the engineers' camp. **4.** MPs from Parliamentary Committee on Blue Economy during a visit to the site. **5.** The Principal Secretary, State Department for Water and Sanitation Julius Korir (left), Project Coordinator Eng. David Onyango (2nd left), Makueni County Commissioner Henry Wafula (2nd right) and the CGGC MD at the site. **6.** A member of staff from SMEC taking a picture of ongoing activities. **7.** Water Secretary Eng. Samuel Alima waters a tree at the site. **8.** Site workers at the dam embankment area. **9.** A view of the employer's camp under construction. **10.** Makueni County Commissioner Henry Wafula plants a tree during a visit. **11.** Staff from SMEC taking notes during works sessions. **12.** A view of Thwake River upstream. **13.** Principal Secretary, State Department for Water and Sanitation Julius Korir leads dignitaries during a tour of the dam. **14.** Water Secretary Eng. Samuel Alima (right) and Project Coordinator Eng. David Onyango celebrate the completion of the embankment filling exercise.





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Great things in business are never done by one person. They're done by a team of people.

Steve Jobs (1955-2011)